

### **REMARKS**

Claims 1-17 are rejected. Claims 18 and 19 are withdrawn from consideration. Claims 1-19 are presently pending in the application. Favorable reconsideration of the application in view of the following remarks is respectfully requested.

#### **Rejection Under 35 U.S.C. § 103(a) over Chee et al. in view of Leblans et al.:**

The Examiner has rejected claims 1-5, 7-12, 14-17 under 35 U.S.C. § 103(a) as being unpatentable over Chee et al. (US 6,429,027 131) in view of Leblans et al. (US 2004/0069857 A1).

The Examiner indicates that Chee et al. discloses a two-dimensional array of microspheres randomly immobilized in wells of a substrate, wherein the microspheres bear biological probes in the form of a bioactive agent that binds an analyte of interest. The Examiner states that the microspheres can comprise a dye in the form of chromophores that can be developed to produce a unique optical signature that allows one to visually identify the microspheres and the bioactive agent bound to the microspheres, and that chromophores as defined by the specification absorb light and convert the absorbed light into heat, which is a photo initiated process. The Examiner further indicates that the microspheres disclosed by Chee et al. differ from the claimed invention in that the reference does not disclose that the dye is a colorless dye that can be developed to a colored state. The Examiner relies on Leblans et al. to teach this limitation. This rejection is respectfully traversed.

Chee et al. discloses sensor compositions comprising a composite array of individual arrays, to allow for simultaneous processing of a number of samples. The compositions comprise a substrate with a surface having a plurality of assay locations, each assay location comprising an array location, the array location comprising a plurality of discrete sites; and a population of microspheres comprising at least a first and a second subpopulation, wherein the first subpopulation comprises a first bioactive agent and wherein the second subpopulation comprises a second bioactive agent. The microspheres are distributed in the discrete sites in the array location.

Leblans et al. discloses manipulating a microcarrier for identification purposes that utilizes a positioning and orienting step prior to or

during the identification step. During the identification step the encoded microcarrier can be identified and labeled.

The present invention relates to a microarray comprising a support, on which is disposed a layer of microspheres bearing biological probes, wherein the microspheres comprise at least one material with a non-fluorescent latent colorant that can be developed to a colored state and used to identify the microsphere.

To establish a prima facie case of obviousness, there must be some suggestion or motivation in the reference or in the general knowledge available to one skilled in the art to modify the reference, there must be a reasonable expectation of success, and the prior art reference must teach or suggest all the claim limitations.

Chee et al. describes a “a molecule whose color or luminescence properties change in the presence of a selectively-binding DBL.”(col. 15, lines 36-38), “a molecule whose color or luminescence properties change in the presence of various solvents.” (col. 15, lines 43-46), “a derivative of fluorescein whose color changes between aqueous and nonpolar solvents.” (col. 15, lines 48-50), and “In general, labels fall into three classes: a) isotopic labels, which may be radioactive or heavy isotopes; b) magnetic, electrical, thermal; and c) colored or luminescent dyes; although labels include enzymes and particles such as magnetic particles as well.” (col. 19, lines 33-37). Chee et al. describes a colored molecule that changes to a different color or fluoresces. Chee et al. fails to disclose a colorless and non-fluorescent molecule as claimed by the instant invention. Leblans et al. also fails to disclose a colorless, latent, non-fluorescent colorant as presently claimed. Leblans et al. discloses the use of fluorescent materials throughout the reference. “Preferred bleachable substances include bleachable fluorescent or electromagnetic radiation absorbing substances.” (par. 0052). The reference also discloses in paragraph 0052 that suitable compounds include fluorescers, formaldehyde induced fluorescence, Flazo Orange, Fluo 3, Fluorescamine, and fluorescein isothiocyanate all of which are fluorescing. “Optionally such bleachable substances will contain functional groups capable of forming a stable fluorescent product with functional groups typically found in biomolecules or polymers.” (par. 0052). “Codes bleached on microcarriers may also be written to have different intensities of fluorescence” (par. 0053).

Paragraphs 0159 through 0168 list examples of fluorescent microcarriers. Clearly Leblans et al. fails to teach or suggest any advantages in the use of colorless and non-fluorescent colorants as claimed by the instant invention. In fact, the reference teaches that the use of fluorescent compounds is suitable, distinguishable from the instant invention. Neither reference alone or in combination discloses a colorless and non-fluorescent latent colorant as claimed by the instant invention.

Additionally, the instant invention has surprising results. The microsphere of the present invention overcome the problem associated with "spectrally addressed microspheres," colored compounds typically used in microspheres are often fluorescent, and hence provide excessive background noise when fluorimetric determinations are performed on the microarray. This problem is overcome through the use of latent colorants, which are colorless and non-fluorescent until switched to a colored state by a chemical reaction, a physical trigger, or some kind of environmental stimulus. A further surprising result of the present invention is that the colorless coding offers no detectable background fluorescence from microspheres, therefore detection is dramatically improved. As such, the dynamic range for measuring target analytes is greatly increased.

Since the references, alone or in combination, fail to disclose all of the presently claimed limitations, the Applicants respectfully request that the Examiner reconsider and withdraw this rejection.

**Rejection Under 35 U.S.C. § 103(a) over Chee et al. in view of Leblans et al. and further in view of Wang:**

The Examiner has rejected Claim 13 under 35 U.S.C. § 103(a) as being unpatentable over Chee et al. in view of Leblans et al. as applied to claims 1-5, 7-12, 14-17, and further in view of Wang (US 4,663,277).

The Examiner indicates that neither Chee et al. nor Leblans et al. discloses the immobilization of the microspheres by a gelation process. The Examiner further indicates that Wang discloses an immunoassay for a virus accomplished by utilizing microspheres coated with antiviral antibodies. The reference discloses that the method of the immunoassay involves immobilizing the microspheres by placing the microspheres in a gel. The Examiner states that it

would have been obvious to one of ordinary skill in the art to further immobilize the modified microspheres disclosed by Chee et al. and Leblans et al. by means of a gel as taught by Wang so that the microspheres are better secured within the wells of the substrate. This rejection is respectfully traversed.

Chee et al. discloses sensor compositions comprising a composite array of individual arrays, to allow for simultaneous processing of a number of samples. Comprising a substrate with a surface having a plurality of assay locations, each assay location comprising an array location, said array location comprising a plurality of discrete sites; and a population of microspheres comprising at least a first and a second subpopulation, wherein said first subpopulation comprises a first bioactive agent and wherein said second subpopulation comprises a second bioactive agent; wherein said microspheres are distributed in said discrete sites in said array location.

Leblans et al. related to manipulating a microcarrier for identification purposes that utilizes a positioning and orienting step prior to or during an identification step. During the identification step the encoded microcarrier can be identified and labeled.

Wang relates to the detection and/or the determination of viruses by an immunoassay method, to materials for such method, and to a virus detection kit. Viruses are detected by means of an immunoassay method in which an extended solid phase coated with antiviral antibody is employed to bind and remove virions from a specimen by forming an immuno-complex with antigens of the virions, a mobile solid phase comprising a dispersion of microspheres coated with the antiviral antibody is used to bind the microspheres to antigens associated with the immuno-complex, and the presence of bound microspheres is detected. The detection sensitivity is amplified by the ability to more readily detect the microspheres, which may be dyed or labeled. The extended solid phase advantageously may be in the form of a dipstick which can be easily contacted with the specimen. A virus detection kit provides the extended solid phase and mobile solid phases, each coated with antiviral antibodies.

The present invention relates to a microarray comprising a support, on which is disposed a layer of microspheres bearing biological probes, wherein the microspheres comprise at least one material with a non-fluorescent latent

colorant that can be developed to a colored state and used to identify the microsphere.

To establish a prima facie case of obviousness, there must be some suggestion or motivation in the reference or in the general knowledge available to one skilled in the art to modify the reference, there must be a reasonable expectation of success, and the prior art reference must teach or suggest all the claim limitations.

Chee et al. describes a colored molecule that changes to a different color or fluoresces. Chee et al. fails to disclose a latent colorant that is colorless and non-fluorescent. As discussed above, Leblans et al. also fails to teach this limitation. Wang also fails to disclose a colorless and non-fluorescent latent colorant as claimed by the instant invention. Wang makes no reference to colorless and non-fluorescent latent colorants and therefore fails to teach or suggest all of the claimed features of the instant invention. As no reference suggests the use of a color-free, non-fluorescing material that can be switched on to form a colored material, the references fail to provide any suggestion to produce the presently claimed invention. Additionally, claim 13 benefits from its dependency on claim 1, which as discussed above, is patentable.

There is also no likelihood of success provided in the references. There is no suggestion to use a non-fluorescing, colorless colorant, which can be developed to form a colored material. The present invention deals with the problem of background noise caused by fluorescence, which lowers or interferes with the detectability of a material producing an optical signal. The references fail to deal with this problem, preferring instead to actually use fluorescent materials.

As discussed above the present invention also provides surprising improvements. The present invention provides improved signal detectability, reduced background noise and a broader dynamic range for measuring target analytes.

Since the references, alone or in combination, fail to suggest the modification necessary to produce the present claims, fail to provide any likelihood of success and fail to disclose all of the present claim limitations, the Applicants request that the Examiner reconsider and withdraw the rejection.

**Rejection Under 35 U.S.C. § 103(a) over Chee et al. in view of Litt:**

The Examiner has rejected claims 1, 3, 5 and 6 under 35 U.S.C. § 103(a) as being unpatentable over Chee et al. in view of Litt (US 4,092,408).

The Examiner indicates that the microspheres disclosed by Chee et al. differ from the claimed invention in that the reference does not disclose that the dye is a colorless dye that can be developed to a colored state. The Examiner further indicates that Litt discloses an enzyme label that interacts with colorless o-nitrophenol dyed sugar to produce a measurable color intensity, and that the enzyme cleaves the sugar from the dye and releases the dye. The intensity of the color is proportional to the enzyme activity. The Examiner states that it would have been obvious to one of ordinary skill in the art to provide the microspheres disclosed by Chee et al. with the dye label disclosed by Litt since the label disclosed by Litt allows the quantification of enzyme activity directly from the intensity of the color produced by the enzyme reaction. This rejection is respectfully traversed.

Chee et al. discloses sensor compositions comprising a composite array of individual arrays, to allow for simultaneous processing of a number of samples. Comprising a substrate with a surface having a plurality of assay locations, each assay location comprising an array location, said array location comprising a plurality of discrete sites; and a population of microspheres comprising at least a first and a second subpopulation, wherein said first subpopulation comprises a first bioactive agent and wherein said second subpopulation comprises a second bioactive agent; wherein said microspheres are distributed in said discrete sites in said array location.

Litt relates to adsorbing Ab<sup>2</sup> from solution in its antiserum and as a solid phase precoating on a substrate followed by adsorbing Ab from its antiserum as a solid phase coating on the Ab<sup>2</sup> coating, followed by carrying out the radioimmunological assay of antigen by contacting the resulting solid phase Ab surface of the double coated substrate with the biological fluid, containing antigen to be assayed and radioactive, fluorescent, or enzyme labeled antigens, to cause the antigen and labeled antigen to become bound in solid phase to the solid phase Ab surface and followed by measuring radioactivity, fluorescence, or enzyme activity of the solid phase bound antigen or of the unbound antigen remaining in solution.

The present invention relates to a microarray comprising a support, on which is disposed a layer of microspheres bearing biological probes, wherein the microspheres comprise at least one material with a non-fluorescent latent colorant that can be developed to a colored state and used to identify the microsphere.

To establish a prima facie case of obviousness, there must be some suggestion or motivation in the reference or in the general knowledge available to one skilled in the art to modify the reference, there must be a reasonable expectation of success, and the prior art reference must teach or suggest all the claim limitations.

As discussed above, Chee et al. describes a colored molecule that changes to a different color or fluoresces, and fails to disclose a latent colorant that is colorless and non-fluorescent. Litt also fails to disclose this claimed limitation. In fact, Litt teaches the use of fluorescent antigens. (col. 4, lines 14-16). Litt also discloses suitable compounds to include fluorescent particles, and that fluorescent spectrometers may be used to measure the fluorescent labels. (col. 7, lines 41-48). The reference fails to teach any advantages associated with non-fluorescing compounds and instead, suggests that fluorescent compounds are suitable. Neither reference alone or in combination teaches or suggests a colorless and non-fluorescent latent colorant as claimed by the instant invention.

Additionally, Litt is non-analogous art as the reference discloses an enzyme cauterized reaction that is incapable of producing a variety of colors. The reference teaches a reaction that is capable of changing color in an assay. However, the instant invention claims a microarray with a layer of microspheres. Each microsphere is independently capable of changing color. The assay disclosed in the reference is incapable of identifying individual microspheres on a microarray based on the development to a colored state. The reference instead releases dye onto an entire assay, creating no distinction in individual microspheres.

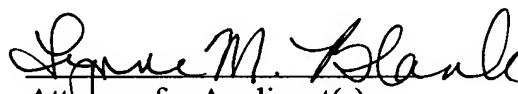
The combination of Chee et al. with Litt is inoperable. Chee et al. relates to identifying microspheres in an array. Litt utilizes a dye that can be developed into a colored state in an assay. Utilizing the microspheres disclosed by Chee et al. and the dye disclosed by Litt, it becomes impossible to identify individual microspheres. The dye disclosed by Litt would cover the entire

microarray, and once developed into a colored state would create no distinction between the microspheres as taught by Chee et al, making it impossible to identify the individual microspheres.

Neither reference, alone or in combination, teaches all of the claimed limitations of the instant invention. Litt is non-analogous art and the combination of the references is inoperable. Therefore, it is respectfully requested that this rejection be reconsidered and withdrawn.

It is believed that the foregoing is a complete response to the Office Action and that the claims are in condition for allowance. Favorable reconsideration and early passage to issue is therefore earnestly solicited.

Respectfully submitted,

  
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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.